

APPLICATION GUIDE  
FOR  
POINT-TO-POINT MICROWAVE RADIO SYSTEM SPECIFICATION  
REA FORM 397d

1. GENERAL
2. AN EXPLANATION OF PART III, REA FORM 397d
3. HOW THE PURCHASER MAY USE PART IIIA TO DESCRIBE THE PROPOSED SYSTEM
4. HOW THE SELLER MAY USE PART IIIB TO DESCRIBE ITS PROPOSAL

APPENDIX A - EXAMPLE SHOWING COMPLETED PART III FOR A HYPOTHETICAL MICROWAVE SYSTEM

1. GENERAL

1.1 This REA TE&CM Section tells how to use Part III of REA Form 397d to fully describe a proposed point-to-point microwave radio system. An example of a completed Part III is included as an appendix to this section.

2. AN EXPLANATION OF PART III, REA FORM 397d

2.1 Persons who use REA Form 397d will recognize that Part III is arranged to add information which fully describes the proposed system. Part III must contain the kinds of information needed to adapt the 397d specification to a particular system.

2.2 Part III includes: Part IIIA, "Purchaser's Equipment Requirements and Technical Data for Application Engineering," and Part IIIB, "Seller's Technical Data."

2.21 Part IIIA of the form is essentially a check list of attachments (addenda) which may be added to the 397d specification by the Purchaser. A check mark must be placed in the box to the left of each item for which the Purchaser has prepared an addendum. Instructions pertaining to the kind of information to be included in each addendum are stated in the paragraph associated with each item on the check list. The Purchaser should prepare as many addenda as necessary to ensure that the Seller will have the information it needs to prepare a responsive proposal.

2.22 Part IIIB is similar to Part IIIA in that it, too, contains a check list. The Seller will check items in Part IIIB for each addendum it submits. In addition to those thought necessary to describe its proposal, the Seller must submit all addenda requested by the Purchaser (see last item Part IIIA).

2.23 Suggested formats for addenda to Part III are contained in the appendix to this section.

### 3. HOW THE PURCHASER MAY USE PART IIIA TO DESCRIBE THE PROPOSED SYSTEM

3.01 A system description in narrative form should be prepared by the Purchaser to describe the scope of the project. It is important to state the ultimate number of channels for which each transmission link (or path) shall be designed. Much equipment and path engineering will be based on that statement. Basic system information may be enhanced by including details which have a secondary relationship to the new system. For instance, the system description might contain an item which describes how service will be rerouted and maintained during construction of the new facilities. It may also be used to describe a plan to remove existing equipment when the new facilities are turned up for service. Quite often a system plan will be improved as a result of writing a system description because it stimulates an awareness of details. After reading the description, the Seller should have a good overview of the project. This overview will make it easier for the Seller to understand how each addendum in Part IIIA relates to the total system.

3.02 A map showing the geographic location of each central office and proposed (or existing) radio site should be prepared by the Purchaser. It will permit the Seller to:

- a. Locate the sites on topographic maps and road maps
- b. Physically locate the sites during a visit
- c. Give the Seller's application engineer a clear picture of the geographic relationship of each site

If new radio sites have not been selected, it will be helpful if the Purchaser can offer possible choices. The Purchaser's knowledge of real estate availability, local road conditions and power availability can help the Seller limit its search range for new sites.

3.03 A trunking diagram should be prepared by the Purchaser to permit the Seller to determine the kinds and quantities of equipment it will supply to establish the proposed trunks. It is important to retain the geographic relationship of the sites shown on the trunking diagram because trunk routing influences the Seller's equipment arrangements.

3.04 A description of existing equipment is necessary if that equipment is to be used in the new system. This description will include information that will be used by the Seller when selecting new equipment to interconnect with the existing equipment. Before the Purchaser decides to include older equipment in a new system, an evaluation of its effect on the new system shall be made. As an example, tests on an existing microwave link carrying 100 channels might show channel noise that is very close to the upper acceptable limit. The Purchaser should then determine whether adding the proposed channels will exceed the loading for which the radio equipment was designed. If the design load will be exceeded, this particular radio equipment should not be included in the final system. This kind of evaluation is important because old equipment built into a new system could make it impractical for the Seller to meet performance specifications stated in Part I of WSA Form 397d.

3.05 A baseband spectrum allocation chart showing existing supergroup, group and channel assignments will provide the Seller with information needed to adapt the baseband to the new trunking plan. This chart may also be used by the Purchaser to show portions of the baseband spectrum dedicated to future uses. If the Purchaser has no plan for allocating the baseband spectrum, the Seller will usually arrange it to satisfy the current trunking requirement at the least cost. As a consequence, the multiplex will need a major rearrangement when future trunks are added. Such rearrangements may be eliminated if the Purchaser will dedicate at least one full supergroup of the baseband spectrum to each end office in the microwave system.

3.06 A statement of connecting company engineering data is needed to determine the kinds and quantities of equipment to be provided by the connecting company. The Seller will use this information to select equipment which will be compatible with the connecting company equipment. When the Seller is responsible for furnishing the connecting company end of the system, the Purchaser need not provide as much detailed information. In all cases connecting company agreements should be reviewed by the Purchaser to

estimate their effect on the cost and schedule for the proposed system. Engineering data supplied by the connecting company is very helpful to the Seller because it contains the same kind of information the Purchaser must provide when describing its central office trunking interface details.

3.07 A description of the multiplex and associated voice frequency equipment may appear to be unnecessary since the trunking diagram illustrates the number and kinds of trunks to be established. However, the trunking diagram may not provide enough information to show the desired system options. High density multiplex has several options which can affect the cost of the equipment but have little bearing on its capability of providing a given quantity of circuits. Options such as group or supergroup regulation do, however, have considerable bearing on the performance of the system. In this situation the Purchaser should remember that Part I of the 397d specification states certain system performance limits which the Seller must design the system to meet. Therefore, the Purchaser need not specify, for example, group regulation since the burden is on the Seller to provide adequate regulation to meet the level stability requirement of Part I. A wide variety of multiplex equipments and arrangements are available. Consequently the Purchaser may elect to specify a particular arrangement instead of allowing the Seller to do it. In either case present and predicted trunk requirements need to be known. If trunk densities of less than 100 are anticipated, radio adaptations of cable carrier multiplex equipment may be specified. Systems which will ultimately provide more than 100 trunks should be designed to use high density ("L" carrier" type) multiplex equipment. The Purchaser and Seller may wish to specify 4- or 6-wire jack fields as a necessary part of a well designed multiplex and associated voice frequency equipment arrangement. However, their value has diminished in recent years due to the "jack-like" design which most manufacturers use in their modular constructed multiplex equipment. Since a service outage can be restored by locating and replacing the defective module, patching to a spare channel is less essential. Most modular units have test points which permit level monitoring for maintenance. Transmission considerations make it desirable to eliminate large quantities of office cabling and attendant transmission losses by (1) eliminating jack fields or (2) mounting jack strips in the multiplex bays. This is not intended to discourage specifying 2-wire jack appearances since these are needed to make net loss and signaling measurements. Trunk group net loss calculations furnished by the Purchaser will permit the Seller to determine pad values for 4-wire terminating sets. The need for line conditioning equipment such as voice frequency amplifiers can also be determined from the net loss calculations. Another very important

piece of information is the Purchaser's central office trunk relay circuit description. It will be used by the Seller to determine the amount and types of equipment needed to interconnect the multiplex and trunk relay equipment. The Purchaser and Seller should evaluate the necessity for each type of equipment by determining how it will be used to meet the performance or reliability requirements stated in Part I of REA Form 397d.

3.08 A description of the microwave radio equipment may be very brief if the Purchaser will allow the Seller to offer the kind of equipment needed to meet or exceed requirements of the 397d specification. The Purchaser may elect to indicate a preference for a particular frequency band or type of diversity but each Seller can offer the best combination of its equipment if these restraints are not given. In all cases the Purchaser should state the channel density for which the system shall be designed. Examples of current channel density design values are 120 channels, 300 channels, 600 channels, 960 channels, etc. If the Purchaser wishes to state its microwave radio equipment preferences, it may review REA TE&CM Section 930, "Use of Point-to-Point Radio (Microwave in Telephony)", for the advantages of using various frequency bands and radio equipment configurations. If the Purchaser plans to locate the microwave equipment several hundred yards from the multiplex equipment, a description of the line facility should be given so the Seller will be able to understand its responsibility for establishing the interconnection. Usually the Purchaser will provide the line facility to accommodate a baseband extension. The Seller should be given the responsibility of providing terminal and repeater equipment.

3.09 The order wire and alarm system description should give the Seller enough information to plan a system that can satisfy the immediate requirements and is flexible enough to be expanded if necessary. The Purchaser may wish to specify certain control functions for remote sites but this capability increases the cost of the system due to the addition of tone transmitters, tone receivers and logic devices. The specifications in Part I may be satisfied by specifying readily available alarm (not alarm and control) systems. At remote stations an alarm display panel option can be a valuable maintenance aid if critical equipment does not contain an alarm lamp. The Purchaser may also specify an alarm system designed to forward alarms to more than one alarm center. This option is desirable where an alarm center is not continuously manned. It should be noted that only one alarm center is necessary to meet the intent of 397d specifications. Requirements of the Federal Communications Commission could supersede the 397d specification if the Purchaser is required to have full-time surveillance of its microwave system alarms. These systems, like the baseband, are

often extended over wire facilities or interconnected to other microwave systems. If the Purchaser anticipates this arrangement, it should give the Seller as much technical information as possible because this type of interface is usually complicated.

3.10 A description of the antenna system may be used to limit the range of equipment offered by the Seller. This can be done by specifying a particular type of tower, antenna and transmission line. If it is not done, the Seller will offer the minimum amount of equipment needed to meet the specifications in Part I. The design wind loading should be stated by the Purchaser. The Electronic Industries Association, which makes wind loading recommendations for all parts of the United States, is referenced in the Part I specifications. Known local wind conditions may not be in agreement with EIA information. Future radio route plans should be evaluated during initial planning because additional antennas cannot be added to towers unless the tower designer anticipated the added loading. The Purchaser can assist the Seller by describing abnormal soil conditions when they are known. This information will be used by the Seller to provide more realistic tower foundation prices in its proposal. The Purchaser should be very cautious of specifying an antenna structure to be located on an existing building because the platform or structure needed to adapt the tower to the building is always a custom designed structure. In fact, some buildings cannot accommodate the added load unless very expensive structural building modifications are made. The Purchaser's building design engineer or architect can evaluate the effect a specific tower will have on the building. Then he can estimate costs of building modifications. When adequate ground space is not available, a roof-mounted tower may be very practical. Item 4.15 of the check list may be used to describe building modifications to be performed by the Seller to make a building suitable for supporting a tower. Passive repeaters are essentially an antenna system. If the Purchaser plans to specify a passive site in the system, he should bear in mind the following:

3.101 Passive repeaters require real estate. This is the Purchaser's responsibility.

3.102 The cost of a passive repeater must include foundation costs and erection costs. These are the Seller's responsibility.

3.103 Preparation of the passive repeater sites, tree clearing along the paths and possibly access roads are the responsibility of the Purchaser.

3.104 A passive repeater is considered to be a radio transmitter site. As such, it must be described in each of its adjacent station applications for FCC Construction Permits.

3.105 If severe ice or snow conditions are anticipated at the passive site, the Purchaser should specify a reflector center line which is high enough above ground to avoid having the surface obstructed by snow. Since these sites do not usually have ac power, ice on the surface of the reflector cannot be removed by electric heaters. The Seller may suggest methods of removing ice.

3.11 A description of power plant equipment that the Purchaser is to provide does not require detailed information if the Purchaser wishes to allow the Seller to design a power plant that will meet Part I specifications. If the Purchaser's knowledge of local conditions suggests that commercial ac power outages will require more than four hours of battery reserve, then the Purchaser should include this information in its description. Driving conditions may also influence this evaluation. When commercial ac outages are expected to last beyond usual battery reserve capacities (4-12 hours), the Purchaser may wish to enhance the power plant reliability by adding a motor generator requirement. There are three types of batteries which are acceptable for microwave systems. They are lead-antimony, lead calcium and nickel-cadmium. Most central offices use lead-antimony batteries. Lead-calcium and nickel-cadmium are suited to remote site applications because of reduced battery maintenance requirements. Nickel-cadmium batteries cannot be floated at a specific voltage due to a characteristic which leads to "thermal runaway." Nickel-cadmium batteries and associated charging equipment are usually more expensive than lead-calcium and lead-antimony. Therefore, the Purchaser is advised to discuss its specific requirements with a battery supplier before electing to specify a particular type. Existing central office power plants which are designed to operate central office switching systems are the least desirable source of power for transmission equipment. This is due to the presence of switching noise and voltage fluctuations caused by traffic peaks. If a purchaser wishes to power a microwave system from an existing plant, the Seller will need information to determine how it can adapt its equipment to operate from that power source. The Purchaser will need to assure itself that the added drain will leave an adequate reserve when an ac power failure occurs. Sophisticated power plants for remote sites which do not have commercial power should be discussed with a power plant supplier before specifications are drawn up. The Purchaser should understand that low power consumption of solid state equipment coupled with new power source developments are factors which stimulate unusual power plant designs that are practical and economical.



3.12 A description of special equipment to be provided by the Seller gives the Purchaser an opportunity to describe unusual hardware requirements not covered elsewhere in Part IIIA. Safety devices, special tools, framing, cable racks and distributing frames are additional items not shown in the check list that may be described in this addendum.

3.13 A description of the buildings to be provided by the Seller will be unnecessary if the Purchaser elects to specify standard REA masonry buildings designed as shown in REA Form 772a. They have desirable characteristics which make them suitable for microwave buildings. These include ruggedness, fire resistance and ease of expansion. And the materials are readily available in all areas of this country. The other types of buildings which the Purchaser may wish to specify are portable or prefabricated structures. These usually require added cost items such as interior finished walls, insulation, special framing supports and costly transportation. They are not as rugged as C.B. buildings. Foundation and erection costs must also be added to their basic price. The 772a contract form has a complete specification within itself which includes foundation work and other details. When non-standard buildings are contemplated, the Purchaser should ensure that items covered in Form 772 are included in a building specification on which the Seller can bid.

3.14 REA Forms 772 and 772a may be used to describe the Purchaser's requirements for buildings which are to be provided by the Seller. It may also be used to purchase buildings on a completely separate contract.

3.15 Detailed plans showing building modifications on which the Purchaser expects the Seller to bid ought to be prepared by an architect or engineer who has an intimate knowledge of the existing structure. This responsibility is very critical if a tower is to be located on the building (see paragraph 3.10). The Purchaser may elect to negotiate a separate contract for this work. Local construction firms will usually do the work for the least cost.

3.16 A floor plan of existing buildings showing tentative and existing equipment locations will help the Seller decide how it will fit its equipment into the available space. The floor plan gives the Seller an opportunity to consider the effect of any existing noise radiating devices on the new equipment. Since central office floor space is expensive, it should be allocated according to a plan. Multiplex and microwave equipment rack



locations must also be located according to a plan. Here then, is a point at which the Purchaser has an opportunity to think about a rack growth plan to permit an orderly expansion of the system. Multiplex rack arrangements are usually planned for low density (120 channels) or high density (600 channels) systems. Radio equipment arrangements do not have this restraint unless a route is planned to carry more than two RF channels in the same direction on the same antenna. In that case, the Purchaser must allocate space for orderly growth of RF racks so that each one may be added to the terminated wave guide port of the previous rack without interrupting service. A Purchaser may also simply delegate floor planning responsibility to the Seller. The Seller will then arrange the racks to fit its particular type of equipment.

3.17 A plot plan sketch of each site where building or tower work is contemplated will show the Seller which areas are available for the construction work. The Seller will use this sketch to consider placement and orientation of a tower foundation and/or building. Before actual work commences, an accurate plot plan containing the plot plan sketch information will be needed to stake the construction area.

3.18 A description of the Purchaser's spare parts requirements is intended to give the Seller some guides which will limit its tendency to automate a spares list. For example: A Purchaser who has two maintenance centers will, most likely, want to equip each center with spares. The same logic applies to equipping maintenance vehicles. In some locations special fuses and lamps may be difficult to find. Purchasers who are faced with this situation may wish to specify several years supply of these items to be included in the Seller's spares quotation. Unless the Purchaser provides some form of guidance, it is likely that the Seller will propose a list of spares which is unsatisfactory.

3.19 A description of the Purchaser's test equipment requirements is intended to be a request for the Seller to quote on special test equipment designed by the equipment manufacturer to service its carrier or microwave equipment. Standard test equipment purchased directly from the test equipment manufacturer will cost less and repair service should be better because the Purchaser will be working directly with the test equipment manufacturer. Sellers are nevertheless encouraged to suggest suitable standard test equipment. If the Purchaser has determined the number of locations for which test equipment will be purchased, that information will permit the Seller to provide correct quantities.

3.20 A description of training to be provided by the Seller establishes a firm requirement which the Seller must include in its cost estimates for the proposed system. The information provided by the Purchaser will also give the Seller the kind of planning information it will need to schedule the training. A Purchaser should insist on training when it has had no experience with the equipment to be installed. Each manufacturer has its own unique line up and test procedure.

3.21 A description of documentation to be provided by the Seller is intended to include all essential drawings and instructions the Purchaser will use to maintain the new system. If the Purchaser has several locations where maintenance or engineering personnel will be located, it should specify at least one complete set for each of those locations. The Seller needs to know the size and complexity of the Purchaser's documentation requirement because it is a cost item which must be included in the Seller's project cost estimates.

3.22 A statement of special considerations gives the Purchaser an opportunity to provide information which has nothing to do with a hardware requirement. For example, the Purchaser may wish to specify that the Seller will provide a frequency plan for the microwave system. The Purchaser may use this statement to waive the requirement for a factory test when the new equipment is to be added to an existing system. This kind of requirement is a work item the Seller needs to know when preparing project cost estimates because it involves expensive engineering manpower. If the Purchaser can anticipate work items and state them in this addendum, the Seller will have fewer opportunities to negotiate contract changes.

#### 4. HOW THE SELLER MAY USE PART IIIB TO DESCRIBE ITS PROPOSAL

4.01 A list of material and services is the basic substance of the Seller's proposal. From this list the Purchaser should be able to learn quantities and types of equipment to be provided by the Seller for each site in the system. Because the REA 397 contract includes installation, there should also be a description of work which the Seller proposes to do at each site. The Seller should consult the "List of Materials Acceptable for Use on Telephone Systems of REA Borrowers" to determine whether equipment included in the proposal has been accepted by REA. Microwave and multiplex equipment are included in the list of acceptable materials.

4.02 A list of spare parts should be based on guidelines set by the Purchaser and the Seller's knowledge of its own equipment. When it can be shown that the Purchaser needs more or less than it has specified, the Seller is invited to make its recommendation accordingly.

4.03 A list of test equipment will be used by the Purchaser to determine if any of the items are already on hand. The Seller's list will also provide information which the Purchaser needs to adjust its test equipment budget. It is likely that only those pieces of test equipment manufactured by the same company that manufactures the communications equipment will be purchased from the Seller. The Purchaser will, of course, give serious consideration to purchasing all test equipment recommended by the Seller. Test equipment should be ordered early so that it will be on hand when the new system is turned over to the Purchaser.

4.04 Calculated noise performance for each trunk group is information the Purchaser and Seller may use to determine whether the new trunks will meet the noise specification stated in Part I of the 397d specifications. If all of the major noise sources in a trunk group are considered, this calculation should be a very valuable tool to assess the suitability of equipment and equipment arrangements proposed by the Seller.

4.05 The calculated maximum power required at each site will be reviewed by the Purchaser to estimate whether existing or proposed power plants can handle the load. The calculation will also be used to determine whether the required power reserve capacity will be adequate.

4.06 A functional block diagram of the Seller's proposed system arrangement will give the Purchaser an idea of the Seller's grasp of the system requirements. A block diagram will also clarify the Seller's method of dropping and inserting portions of the baseband. The Purchaser can then see how the radio baseband will be affected by baseband bridges and splitting filters proposed by the Seller. The block diagram can also be used to evaluate system effects resulting from increased noise on any single section. Another item of information the Purchaser may learn from a block diagram is the Seller's proposed method of extending or interconnecting the baseband. Voice frequency extension losses and equipment arrangements may also be shown.

4.07 A functional block diagram of the order wire and alarm system will help the Purchaser understand the Seller's proposed system. It will also be compared to the Purchaser's specification for compliance.

4.08 A chart of the baseband spectrum allocations for the proposed system will help the Purchaser understand how any drop and insert locations affect the use of the total baseband spectrum. Here, too, the Purchaser will have an opportunity to assure itself that the Seller understands and complies with spectrum allocation requirements when stated in Part IIIA.

4.09 Preliminary radio frequency engineering data for each micro-wave path may be used by the Purchaser to examine the path engineering concepts used by the Seller. It can also provide the Purchaser with basic information such as tentative tower heights and antenna sizes.

4.10 Building plans and general specifications for non-REA buildings will be used by the Purchaser to evaluate the suitability of the proposed buildings. Information contained in the Seller's proposal will be used to determine compliance with local building codes. The plan and specifications will also be examined to determine acceptability of construction details, materials, finishes, and equipment included in the completed building.

4.11 A project completion schedule will give the Purchaser and Seller an opportunity to (1) budget the work time, and (2) periodically check the work progress to evaluate ways to speed the work if several of the activities are not completed as scheduled. This should reduce the possibility of a project cutover date being missed because of poor coordination of each phase of the work. The schedule will give the Seller and the Purchaser a tool to recognize delays in time to do something about them.

4.12 Deviations or exceptions violate the intent of a specification except when they introduce information which is new and necessary to do the work. It is to the advantage of the Purchaser and Seller to insure that enough information is given to severely limit the necessity for contract changes.

APPENDIX A

Example Showing Completed Part III For  
A Hypothetical Microwave System

1. It is recognized that each system is different. Each engineering firm and each supplier have relatively established methods of presenting information. REA Form 397d is arranged to permit each party to use its own format when submitting information. For those who do not have an established format, we have included the following pages which include details for a microwave system containing considerations described in this section. Where information would be essentially repetitive, only one such sample is included in this hypothetical example.

### PART III

#### POINT-TO-POINT MICROWAVE RADIO EQUIPMENT

#### PURCHASER'S EQUIPMENT REQUIREMENTS AND TECHNICAL DATA

#### FOR APPLICATION ENGINEERING AND SELLER'S TECHNICAL DATA

##### 1. GENERAL

The addenda checked in Part IIIA are supplied by the Purchaser to aid the Seller in quoting on a Point-to-Point Radio (Microwave) system to provide circuits between the central offices listed herein. The Seller shall complete Part IIIB addenda where applicable and submit any additional information it deems necessary to fully describe the system proposed. Examples are included in REA TE&CM Section 933, Issue 2, "Application Guide for Point-to-Point Microwave Radio Specification REA Form 397d."

1.1 Where the connecting company will own a portion of the RF and multiplex equipment which comprises the system covered in this specification, the Purchaser shall provide the Seller with all available technical information by attaching a description to Part IIIA.

1.2 Extensions of multiplex channels over paired telephone cable or open wire circuits shall be treated as trunk carrier and covered in REA Form 397b. All multiplex (carrier) equipment used at the far end of the physical facility shall be listed in Form 397b under the name of the central office in which the channel modem units and four-wire terminations are placed. This equipment need not be specified in Part III of REA Form 397d; however, the terminal equipment which connects into the RF baseband shall be included in REA Form 397d.

PART IIIA

POINT-TO-POINT MICROWAVE RADIO EQUIPMENT

PURCHASER'S EQUIPMENT REQUIREMENTS AND TECHNICAL DATA

FOR APPLICATION ENGINEERING

(See REA TE&CM Section 933)

1. Purchaser's addenda to this specification are:

- 1.01 ☒ A narrative description of the proposed system including locations, kinds of trunks to be established, types of equipment existing and to be added, connecting company considerations and the cutover date, if known.
- 1.02 ☒ A map showing the geographic location of all central offices and fixed radio sites to be included in this system. It should also include road information, mileages and other landmarks which can be used to locate the sites.
- 1.03 ☒ A trunking diagram showing the quantity and type of circuits to be established between each office. It should also include mileages and types of facilities. Geographic relationships between offices must be maintained on this diagram.
- 1.04 ☒ A narrative description of existing equipment which Purchaser proposes to include in the new system. This description should contain existing equipment manufacturer's name, model number, location of equipment, existing tower heights, interface levels and any information which may help the Seller to better understand the Purchaser's existing system.
- 1.05 ☒ A baseband spectrum allocation chart illustrating existing supergroup, group and channel assignments between existing locations. Proposed frequency allocations may also be shown on this chart.
- 1.06 ☒ A statement of connecting company engineering data. This should include the type of connecting facility, quantity and type of trunks to be established, types of signaling, and terminating equipment to be provided by the connecting company and other information which may affect the cost and time of completion of this work.



1.07 ☒ A description of the multiplex and associated VF equipment to be provided by the Seller. This should include a statement of operating voltage, the number of channels for which the equipment shall be arranged to expand, multiplex options such as frequency synchronization or supergroup regulation, the number of circuits to be wired, the number of circuits to be equipped, kinds of signaling to be provided, kinds of voice frequency terminating devices to be provided, kinds of jacks, and any other miscellaneous equipment. All equipment should be listed by location and circuit group with which it is to be associated. A statement of required operating net losses by trunk group must be included in this list. The Purchaser must also include a complete description of its central office trunk relay equipment to which the new equipment will be connected. Rack heights must be shown for each location.

1.08 ☒ A description of the microwave equipment to be provided by Seller. This may include a statement of operating voltage, kind of configuration (diversity, standby, other), whether terminal or repeater, preferred operating frequency band (2, 4, 6, 11 GHz) and quantities for each location. Rack heights must be shown.

1.09 ☒ A description of the order wire and alarm system to be provided by Seller. This should describe the line facilities to be used, the location of the alarm center, the number of alarms and control functions, maximum alarm and control function capability, location of order wire appearances, and central office alarms to which this equipment will be connected at the alarm center. State quantities for each location.

1.10 ☒ A description of the antenna systems to be provided by Seller. This should show the kind of towers (guyed or self-supported), desired wind loading, ultimate number of antennas, type of antennas (parabolic, shrouded, horn-reflector), preferred transmission line (type of wave guide or coaxial cable) and tower lighting information, if known.

1.11 ☒ A description of power plant equipment to be provided by Seller. This should include Purchaser's battery reserve requirement, a requirement for motor generators (when needed), availability of commercial power, reliability of commercial power, preferred battery voltage, preferred type of battery (lead-calcium, etc.). Quantities must be stated for each location. If Purchaser's power plant is to be used, a statement of existing voltage, capacity, busy hour load and charger capacity shall be made for each location.

1.12 ☐ A description of special equipment to be provided by Seller. This should include special signaling, terminating or other equipment which has not been described in other addenda to this specification.

1.13 ☒ A description of the buildings to be provided by Seller. This should include type of construction, size, specifications and location of each building.

1.14 ☒ REA Forms 772 and 772A for each standard masonry building to be provided by Seller.

1.15 ☒ Detailed plans showing building modifications to be performed by Seller. Plans should contain enough information to allow Seller to obtain a firm construction bid on the work.

1.16 ☒ A floor plan of existing buildings showing tentative and existing equipment locations. The plan should be drawn to scale and existing equipment should be identified.

1.17 ☒ A plot plan sketch of each site where building or tower work is contemplated. This sketch should identify plot boundaries, show existing structures, locate underground and overhead utilities and show proposed location of new construction.

1.18 ☒ A description of Purchaser's spare parts requirements. This should include the number of spare modules the Purchaser proposes to stock for each active module whose failure can affect service on ten or more circuits, the number of spare passive modules for each passive module whose failure can affect service on 60 or more circuits, and a statement of the number of years supply of fuses and lamps to be stocked by Purchaser.

1.19 ☒ A description of Purchaser's test equipment requirements. This should include a requirement for a full complement of Seller's card extenders and all special test equipment manufactured by the Seller to service its equipment.

1.20 ☒ A description of training to be provided by Seller. This should include the number of employees to be trained, the preferred training location (factory or field) and the level of training desired.

- 1.21 ☒ A description of documentation to be provided by Seller.  
This should include path survey data, equipment rack  
profiles, floor plans, system block and level diagrams and radio log  
books. Quantities should be stated.
- 1.22 ☒ A statement of special considerations. This may include  
assignment of responsibilities not covered elsewhere,  
special operating conditions, soil information, etc.
- 1.23 ☒ The Seller shall submit information for the following items  
in Part IIIB: 1.01 to 1.09, 1.11
-

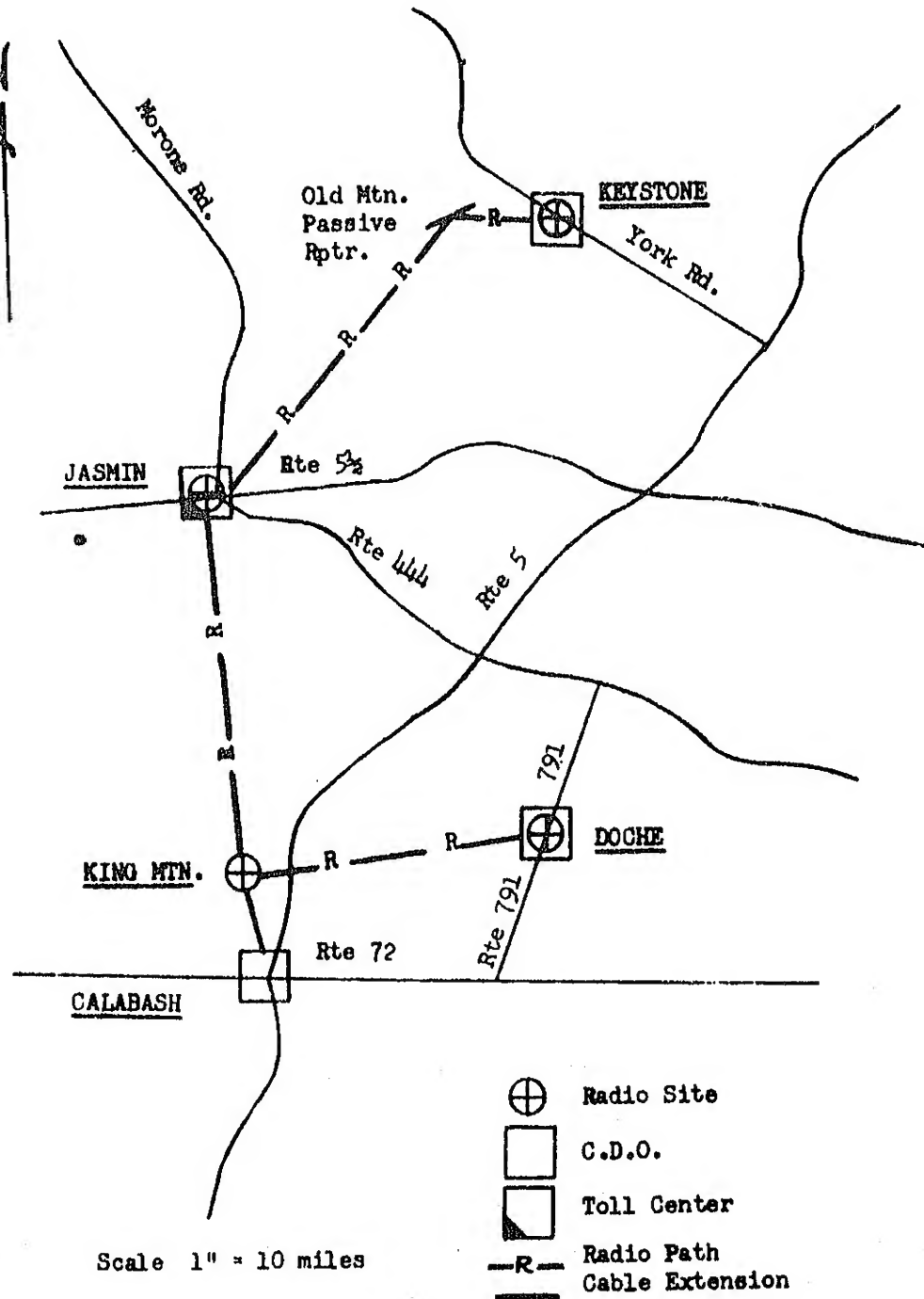
System Description

The microwave system contemplated by these specifications proposes to (1) expand an existing microwave-multiplex system between Calabash and Jasmin to include the existing CDO at Doche, (2) establish a new 120 channel capacity microwave link between Doche and King Mountain where it will interface with the existing system and (3) establish a new 600 channel capacity microwave system between Jasmin and Keystone. The seller will provide a new building at Keystone. New equipment will be installed in existing buildings at all other sites. The seller is to provide self-supported towers at Keystone and Doche. At Keystone there is space to locate the tower on the ground at the rear of the existing central office building. At Doche it will be necessary to place the tower on the roof of the building due to the size of the lot. This will permit a planned expansion of the building at that location. The tower supplier has stated the existing towers at King Mountain and Keystone can accommodate an additional 12 foot parabolic antenna.

Existing power plants are to be used at all sites except Keystone where a new power plant will be provided by the purchaser.

Existing trunking arrangements, Doche-Jasmin and Keystone-Jasmin, will be retained in service to supplement the new trunks. These are carrier derived trunks which will not be affected by this specification. At Keystone the purchaser will move the existing carrier terminals to the new central office after the new office is cut over.

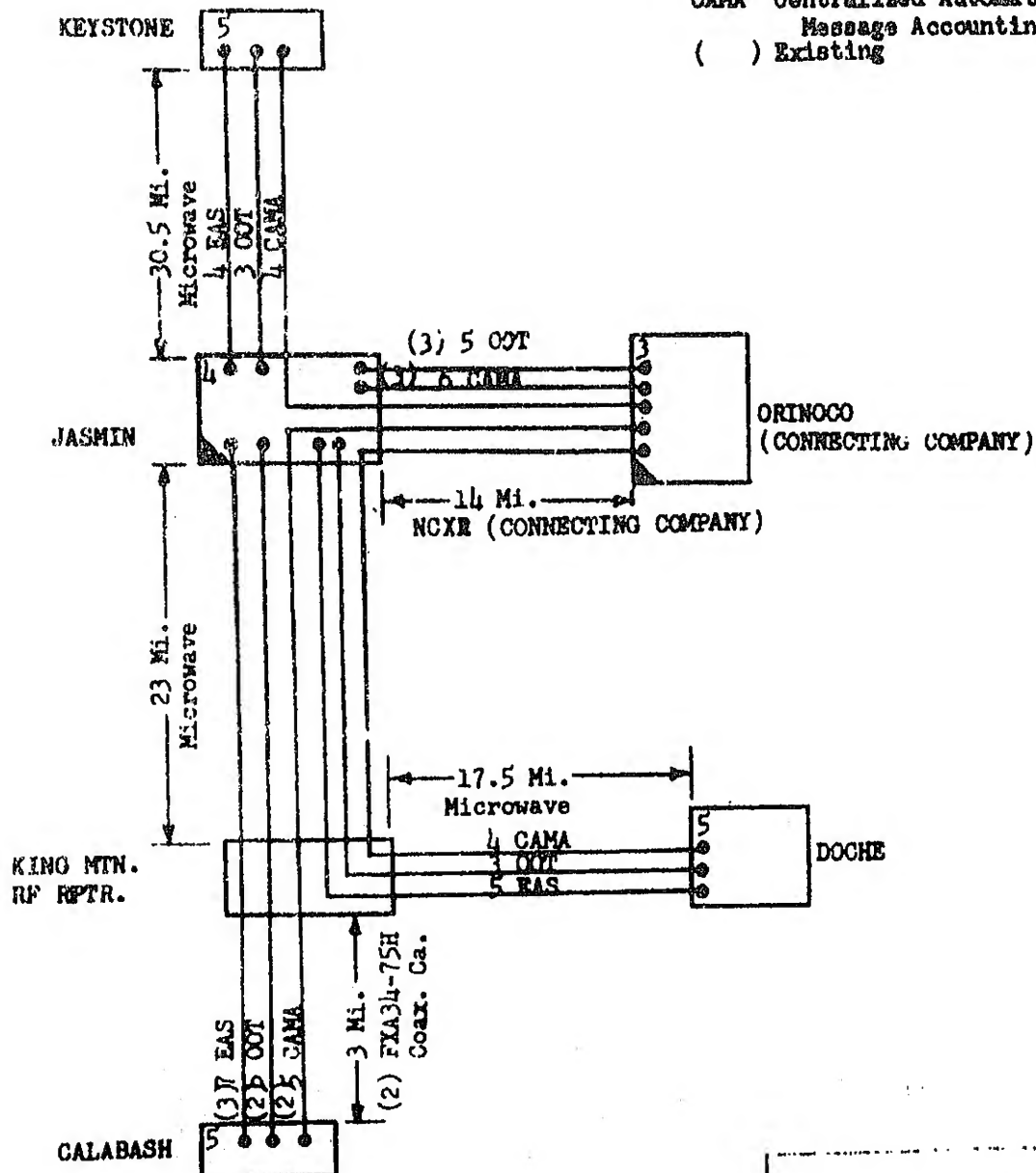
Addenda describing the requirements more fully are included.



MICROWAVE ROUTE MAP  
 BENDER TELEPHONE COMPANY  
 JASMIN, OKLAHOMA

LEGEND

- ▲ Toll or Primary Center
- 5 Class of Office
- SS Special Service Trunk
- EAS Extended Area Service Trunk
- OOT Operator Office Trunk
- CAMA Centralized Automatic Message Accounting Trunk
- ( ) Existing



TRUNKING DIAGRAM  
BENDER TEL. CO.  
JASMIN, OKLAHOMA

Description of Existing Equipment  
Which Purchaser Proposes to Include in New System

The existing Calabash-King Mountain-Jasmin system contains a Faritcolenge 6GHZ frequency diversity link between King Mountain and Jasmin. The baseband is extended between Calabash and King Mountain on a composite coaxial cable as shown on the trunking diagram. Tower heights are 120' at Jasmin and 80' at King Mountain.

The aerial coaxial cables are terminated in a Faritcolenge UB-2 wire line entrance link which is equalized and regulated for 600 channel loading.

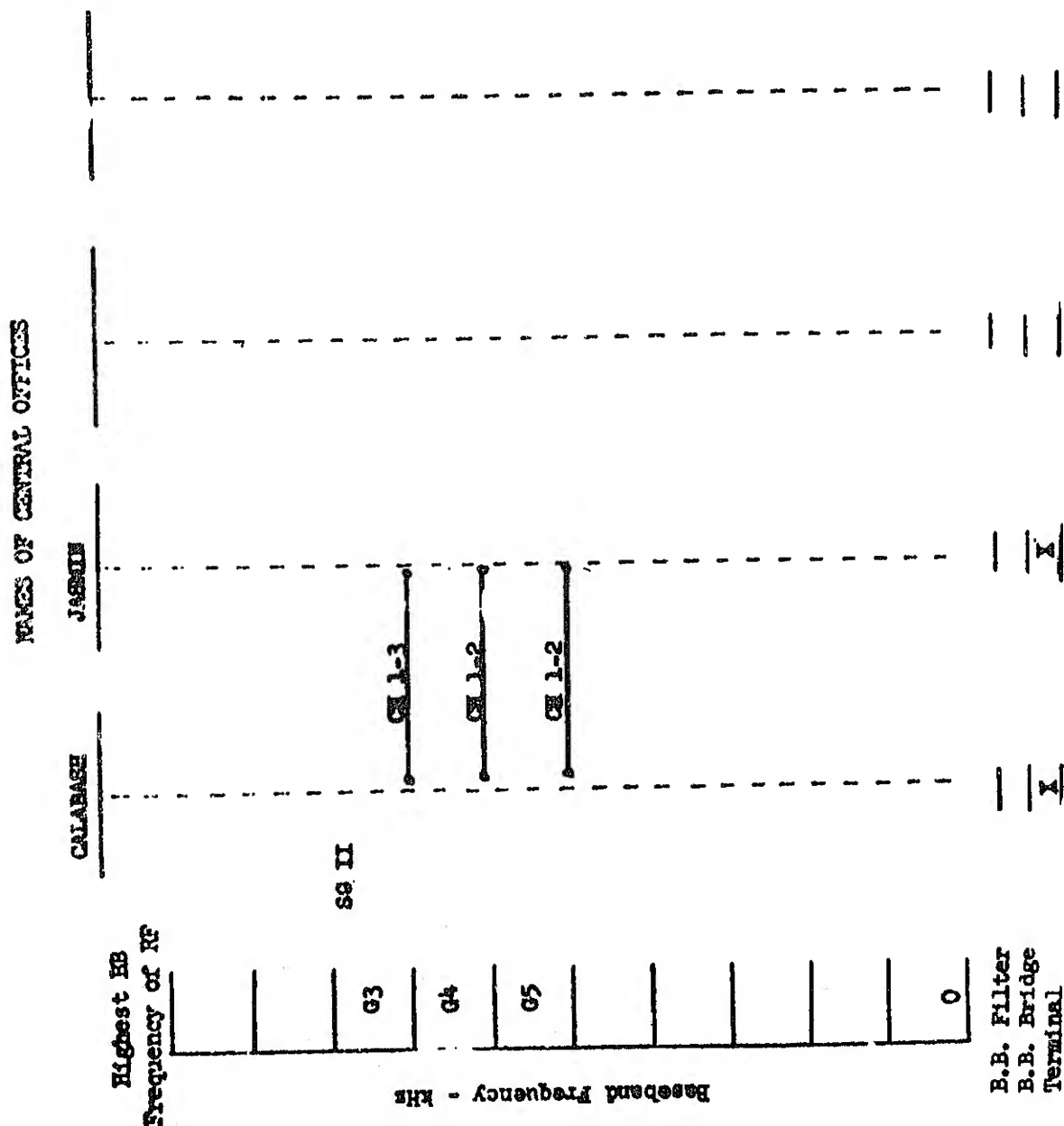
The multiplex is Faritcolenge 600M. It is arranged to be expanded to 120 channels at Calabash and Jasmin. Present use of super group II is shown on the existing baseband frequency allocation chart attached to this specification. It is anticipated that SG I will be established for the Doche-Jasmin trunks.

Present side band levels into the radio are -41 dbm. Tone levels into the radio from the alarm system should not exceed -30 dbm. The wire line entrance link is a zero loss system.

The existing alarm system will be removed by the Purchaser.



Existing Baseband Frequency Spectrum Allocation Chart



REA Project No. 9090  
Addendum No. 1.05

Location JAPAN  
\_\_\_\_\_  
\_\_\_\_\_

**STATEMENT OF CONNECTING COMPANY  
INFORMATION TO BE COMBINED BY SELLER**

Discussions with South Ways Ball (connecting  
company) regarding the method of interconnection have led  
to the following conclusions:

Microwave

-

Baseband extension

-

Carrier

CAMA and outgoing operator trunks to be connected  
to N-2 carrier through 23 DB pads on a 4 wire basis.

VF

-

Signaling

Seller's out of band E&M leads to be interconnected  
with Seller's SF signaling units associated with the  
SWB N-2 systems.

Location Keystone  
Doche

Description of Multiplex and VF Equipment  
to Be Provided by Seller

Multiplex equipment to be provided by Seller shall be arranged  
in accordance with requirements shown. It shall operate from  
48 volts and shall be arranged for expansion to 60  
channels

Seller shall equip each multiplex terminal with

Frequency synchronization ( )

Group regulation (x)

Redundant carrier supply (x)

Other

Qty. 12 channel ends to be provided by Seller.

Terminating devices to be provided by Seller are shown.

Jackfields shall be supplied as shown.

Floor space for 1 19" equipment racks is available  
for this equipment. Racks provided by Purchaser -  
Seller X.

Rack height 9' 0" Rack description Top Supported.

REA Project No. 9090  
Addendum No. 1.07

Location DOCHE

KINSTON

Circuit Group Designation and/or Description

Termination Requirements	OOT EAS	Jasmin *E W	*E W	*E W	*E W
TRUNK SIGNALING EAM, R.D., Loop	EAM				
C.O. TRUNK					
Ckt. Mfr.	Stromberg				
Ckt. No. and Options	SD 7040 K, L				
TERMINATION 4W or 2W	2W	12 20			
PTN or Comp Net	Comp. Net				
MULTIPLY SIGNALING In or Out of Band	Out of Band	12			
MISC. EQUIPMENT Pads					
Pulse Link Reptr.					
DX, CX, LMX					
Repeat Coils					
JACK STRIPS					
2W, 4W, Sig. Mon, Other	2W	12 24			
Net Loss	2.5 db				

\*E Equip.  
W Wire Only

REA Project No. 9090...  
Addendum No. 1.08

Location Jassia  
Keystone  
Rocks

**DESCRIPTION OF RF EQUIPMENT  
TO BE PROVIDED BY SELLER**

RF equipment to be supplied by Seller shall operate from

48 volts DC.

- repeaters shall be furnished by Seller.

1 terminals shall be furnished by Seller.

RF equipment supplied by Seller shall operate in a (F. DIV.)  
(S. DIV.) (H. STDBY) (OTHER) Non-Standby configuration.

Floor space available for (Qty) 1 19" equipment racks  
is available for this equipment. Racks provided by Purchaser

by Seller X.

Rack height 9' 0". Rack description top supported

Location JASMIN  
\_\_\_\_\_  
\_\_\_\_\_

**DESCRIPTION OF ORDER WIRE AND ALM SYSTEM  
TO BE PROVIDED BY SELLER**

A station alarm system is to be provided by Seller and arranged  
as follows:

Line facility to be used (BB) X (WIRE) -.

Qty. alm functions 10.

Qty. control functions 0.

Local display (✓) X.

Expandable to 10 alms 0 controls  
10 stations.

Master terminal/s (Qty.) 1\*.

Equip master terminal with alm. contacts to permit  
interconnection to C.O. major X minor X  
audible X alarm system.

An order wire is to be provided by Purchaser Toward King Mountain  
Seller Toward Keyat, and arranged as follows:

Tel set appearance at this location X.

Extension via - facilities to -.

Floor space for Qty. - 19" racks is available for  
this equipment. Racks provided by Purchaser X

Seller - Rack height - Rack description  
-.

\*This alarm system to replace existing alarm system on  
Calabash-King Mountain-Jasmin system.

REA Project No. 9090  
Addendum No. 1.10

Location KEYSTONE  
DOCHE

**DESCRIPTION OF ANTENNA SYSTEM  
TO BE PROVIDED BY SELLER**

Antenna supporting structure supplied by Seller X\*\*  
shall be (GUYNED) - (S.S.) X  
(OTHER) -, and located in accordance with  
attached plot plan sketch.

Existing antenna supporting structure is a Mfr. -  
Model -.

Tower lighting and alarm relay panel to be provided by Seller  
X (if required by FAA).

Antennas transmission line, pressurization and necessary hardware  
to provide a complete antenna system are to be supplied by  
Purchaser - Seller X\*.

Protective covering and/or anti-icing shall be provided by  
Seller X.

Additional antenna system features to be provided by Seller are:

\*Antennas to be shrouded type if mounted on towers.

\*\*Seller to modify building at Doche per attachment to this  
specification to support roof-mounted tower.



REA Project No. 9090

Addendum No. 1.11

Location JAMNIN

**DESCRIPTION OF POWER PLANT  
TO BE PROVIDED BY SELLER**

Commercial AC is X is not - available at this location. Normal variation of AC voltage is + 12 volts.

Existing central office battery to be used with proposed equipment is 48 volts. Ampere hour capacity of existing battery is 150. Present busy hour load is 74 amps. A 4 hour busy load reserve must be retained if proposed equipment is powered from existing battery.

New battery plant to be provided by Purchaser -  
Seller - shall be - volts. A - hour busy load reserve is required.

Additional batt. accessories to be provided by Seller are:

Existing charger capacity is 75 amps.

Purchaser X Seller - shall provide (Qty.)  
1 charger/s rated at 25 amps, 48 volts DC.

Existing standby generator is rated at 50 KVA.

New standby generator provided by Purchaser -  
Seller - shall be rated at - KVA.

A complete - fuel system, exhaust system and air circulation system is to be provided by Purchaser -  
Seller -.

REA Project No. 9090  
Addendum No. 1.13

Location KEYSTONE  
\_\_\_\_\_  
\_\_\_\_\_

**DESCRIPTION OF BUILDING  
TO BE PROVIDED BY SELLER**

Building to be provided by Seller shall be 15 ft. x  
20 ft..

Standard masonry construction X other \_\_\_\_\_.

Building to be fully X partially \_\_\_\_\_ equipped with  
framing and cable rack by seller. Framing height above floor  
is 9' 0" ft.

Framing and cable rack in existing building to be provided by  
Purchaser \_\_\_\_\_ Seller \_\_\_\_\_.

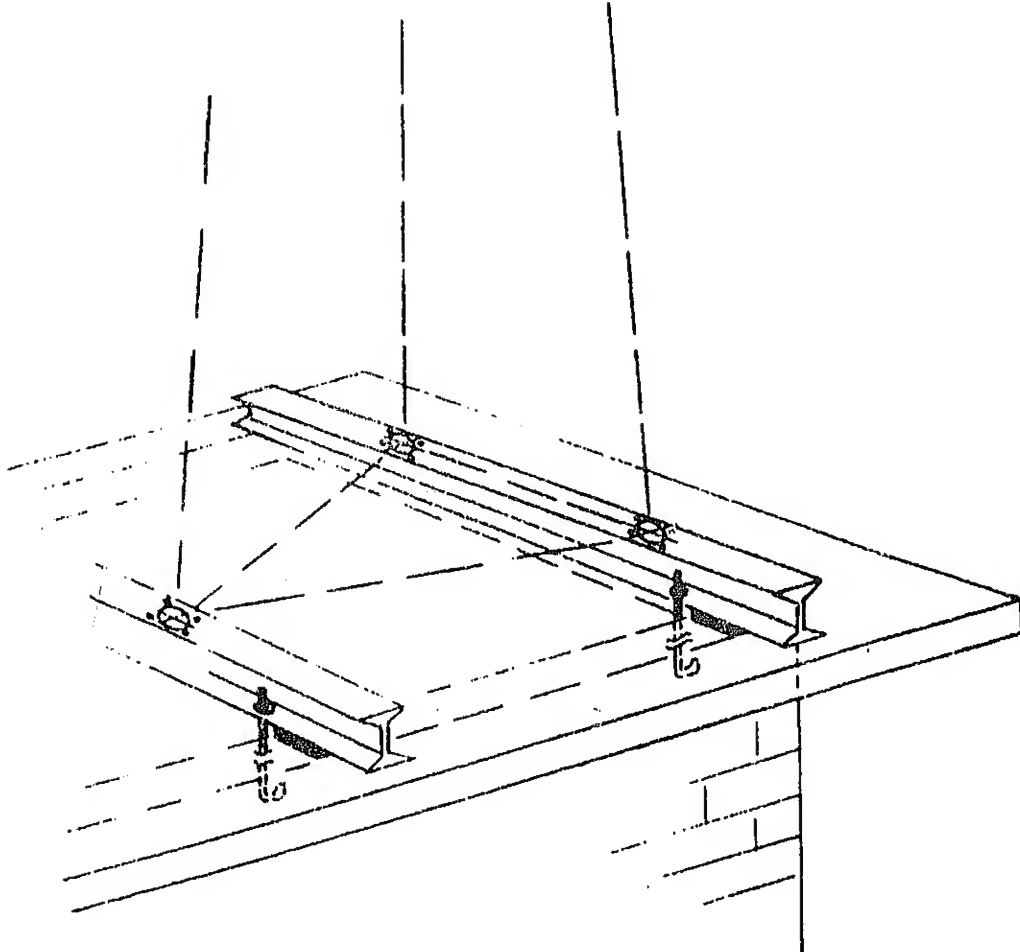
A.C. and D.C. distribution cabling in existing building to be  
provided by Purchaser \_\_\_\_\_ Seller \_\_\_\_\_.

Grounding system shall be provided by Purchaser \_\_\_\_\_  
Seller X \_\_\_\_\_.

Other building requirements to be provided by seller X\* \_\_\_\_\_.

\*Air conditioning and electric heat as shown on 772A Dwg.

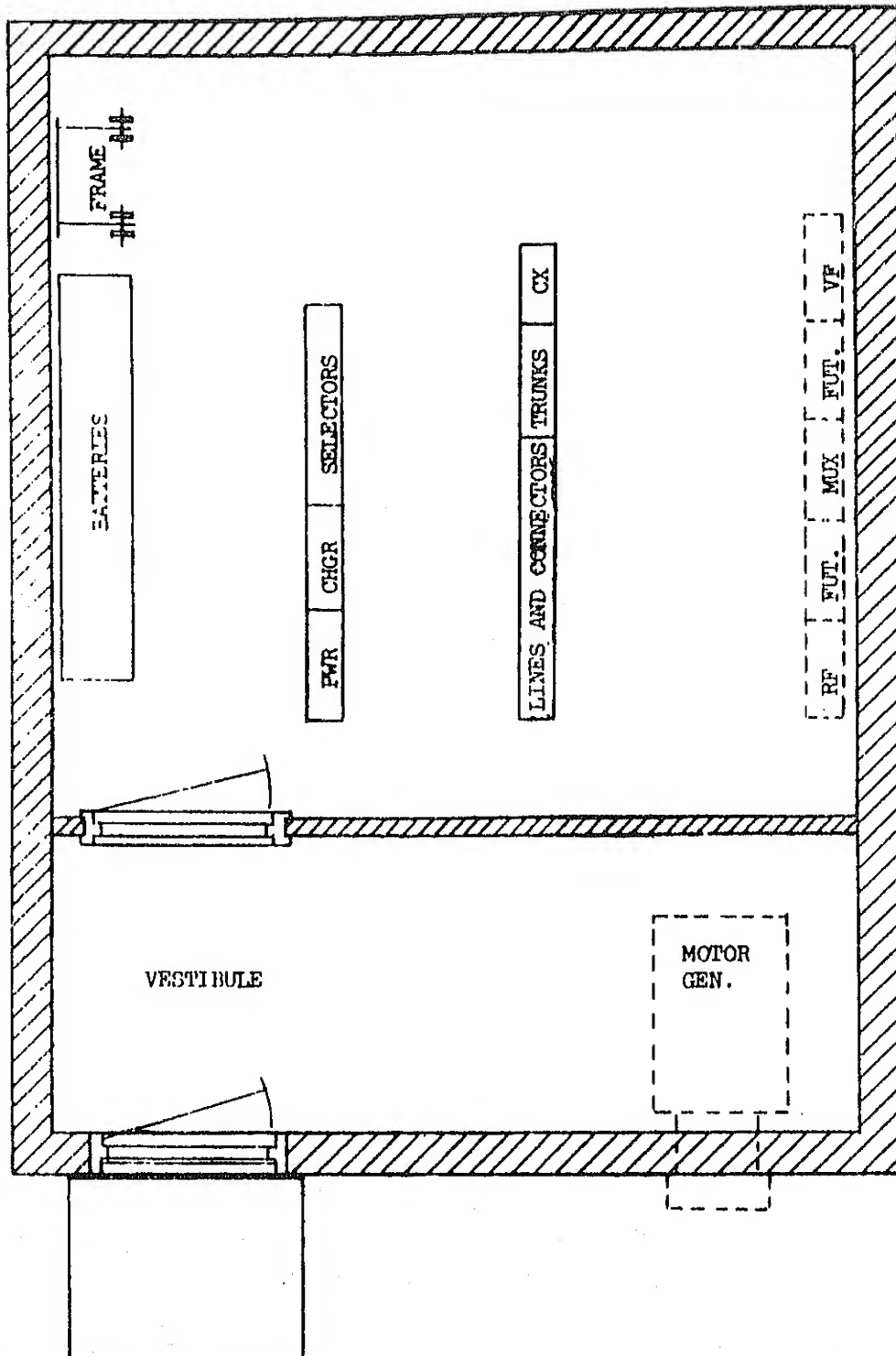




Notes

1. Wide flange I-beams to be sized when final tower reactions are known.
2. This platform design to be used for S.S. tower heights not to exceed 50'.
3. Anchor bolt setting, size, and quantity to be determined when final tower moments and reactions are known.
4. Remove roofing to permit bearing block to rest on concrete surface. Waterproof with pitch pocket or equivalent.
5. Platform design to be approved by consultant for Bender Tel. Co.

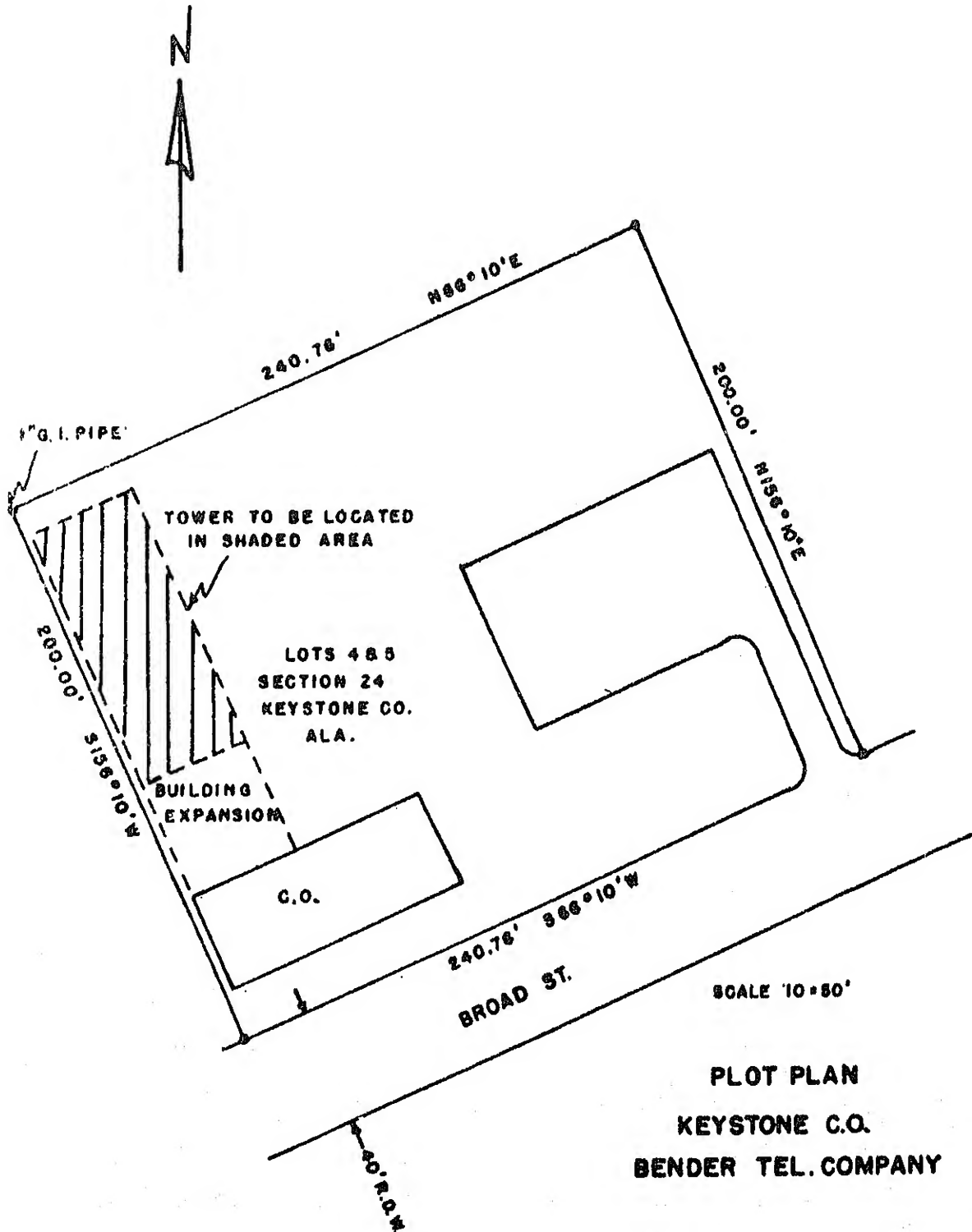
Building Modification  
to  
Provide Tower Platform  
at  
Doche C.D.O.  
Bender Tel. Co.



FLOOR PLAN

Scale 3/8" = 1' - 0"

REA Project No. 9090  
Addendum No. 1.17



REA Project No. 9090  
Addendum No. 1.18

Location JASMIN  
\_\_\_\_\_  
\_\_\_\_\_

DESCRIPTION OF SPARE PARTS  
REQUIREMENTS TO BE CONSIDERED BY SELLER

1. Seller shall supply spare equipment as follows:
  - 1.1 Spare module for each active module which can affect service on 10 or more circuits.
  - 1.2 Spare module for each passive module which can affect 60 or more circuits.
  - 1.3 Spare fuses and lamps based on estimate of quantity required for one year of equipment service.

Addendum No. 1.19

DESCRIPTION OF TEST EQUIPMENT  
TO BE PROVIDED BY SELLER

1. Seller shall provide test equipment based on the following considerations:
  - 1.1 A maintenance center at Jasmin to be equipped to provide routine maintenance.
  - 1.2 A maintenance vehicle equipped to provide routine maintenance at other locations.
  - 1.3 Test equipment to be only those items manufactured by microwave and multiplex manufacturer shown in Seller's proposal.
2. Seller is encouraged to include a list of recommended test equipment to be supplied by others.



REA Project No. 9090  
Addendum No. 1.20

Location JASMIN  
\_\_\_\_\_  
\_\_\_\_\_

DESCRIPTION OF TRAINING  
TO BE PROVIDED BY SELLER

Seller shall offer to conduct a system maintenance training course at Seller's X Purchaser's - location for (Qty) 2 Purchaser's employees. Training objectives are to provide working knowledge of emergency and routine maintenance procedures required to keep the system performing satisfactorily. The Seller shall be responsible for providing all training aids, materials, test equipment and instructors. Seller shall provide system equipment when training is conducted at Seller's location. Purchaser's system shall be used for training when classes are conducted at Purchaser's location.

Addendum No. 1.21

DESCRIPTION OF DOCUMENTATION  
TO BE PROVIDED BY SELLER

3 sets of instruction manuals shall be provided by Seller for each type of equipment.

3 sets of path survey data.

3 sets of rack profiles and floor plans.

3 sets of the system block and level diagram.

2 radio log books.

Documentation in addition to above items shall be provided by Seller as follows:

**STATEMENT OF SPECIAL CONSIDERATIONS**

The equipment, materials and installation that comprise this system shall meet the requirements of Parts I, II and III of this specification (REA Form 397d).

Path information based on a map study is adequate for a proposal. However, cost of a site survey shall be included in the proposal.

Normal soil shall be assumed when preparing tower and building foundation proposals. Variations shall be treated by contract amendments.

Seller shall provide technical data required to complete FAA and FCC forms. Seller        -        purchaser   X   will provide and complete FAA and FCC forms and submit them to these agencies after purchaser signs them.

PART IIIB

POINT-TO-POINT MICROWAVE RADIO EQUIPMENT

SELLER'S TECHNICAL DATA

(See REA TE&CM Section 933)

1. Seller's addenda to this specification are:

- 1.01 ☒ A list of material and services to be provided by Seller for each location. This should include training.
- 1.02 ☒ A list of spare parts to be provided by Seller.
- 1.03 ☒ A list of test equipment to be provided by Seller. This should include Seller's recommended list of test equipment manufactured by others.
- 1.04 ☒ Calculated noise performance for each trunk group. This should include a summation of the noise contribution of all radio links and multiplex terminals in each trunk group.
- 1.05 ☒ Calculated maximum power required at each site for equipment provided by Seller.
- 1.06 ☒ A functional block diagram of the system showing the voice frequency, multiplex and RF baseband arrangement. This should illustrate the proposed plan at baseband drop and insert locations, and the planned method of extending the baseband where applicable.
- 1.07 ☒ A functional block diagram of the order wire and alarm system. This should illustrate bridging arrangements, auxiliary amplifiers, tone frequencies, location of alarm center and location of special filters.
- 1.08 ☒ A chart of the baseband spectrum allocations for this system. This should illustrate supergroup, group and channel assignments between all locations. Existing and proposed assignments should be shown.
- 1.09 ☒ Preliminary radio frequency engineering data for each microwave path. This should include tentative site locations, path lengths, antenna sizes, transmission line information, calculated fade margin and a propagation reliability estimate.

REA Project No. 9090

Seller Faritcolenge

- 1.10 ☐ Building plans and general specifications for non-REA buildings to be provided by Seller. This should include foundation details, structural details, size of building, interior and exterior finish details, electrical plan and temperature control plan.
- 1.11 ☒ A project completion schedule. This should include time allocations for the path survey, FCC activity, equipment manufacture, system engineering, construction work, equipment installation, line-up, and testing in order to meet the cutover date.
- 1.12 ☐ Deviations or exceptions (see last paragraph on page 1 of REA Form 397).

LIST OF MATERIAL AND SERVICES TO  
BE PROVIDED BY SELLER

Seller will engineer, furnish, and install the following:

JASMIN

- (1) 6 GHZ Faritcolonge non-standby RF terminal
- (1) Antenna system including Andy 12' shrouded antenna, wave guide and pressurization system. Antenna to be mounted on existing tower.
- (1) Multiplex terminal arranged for 120 channels consisting of 3 racks of equipment. Colen model 120 M. SG, GP, and channel equipment to be provided per attached baseband frequency allocation chart.
- (1) V.F. equipment rack containing term sets, PEN's, and pads per Part IIIA of specification.
- (1) V.F. equipment rack containing SF ~~common~~ equipment and SF units per Part IIIA of specification.
- (3) Sets of documentation per Part IIIA of specification
- (36) Faritcolonge channel units mounted in existing plus 3 additional channel bank shelves.
- (1) Set SG1 and G1, G2, G3 plug-in modules. Faritcolonge Model 600M.
- (1) Alarm center equipped for 3 stations. 10 alarms/station. Morse, Model A-3.

### LIST OF TEST EQUIPMENT

Seller proposes to provide the test equipment described in Part IIIA  
for the sum of \$4,200.

### LIST OF SPARE PARTS

- (1) pre amplifier
- (1) I.F. strip
- (1) limiter discriminator
- (1) transmit modulator
- (1) baseband amplifier
- (1) RF power supply 48V
- (1) RF power supply 24V

NOTE: These RF units for 2 GHZ system. Existing spares to be used  
for new 6 GHZ.

- (1) SG 1 modulator
- (1) SG 1 demodulator
- (1) GP 1 mod, demod
- (1) GP 2 mod, demod
- (1) GP 3 " "
- (1) multiplex power supply
- (1) baseband receive amp.
- baseband transmit amp.

1 yr. supply)

TOTAL PRICE \$3,200

REA Project No. 9090  
 Seller Faritcolenge  
 Addendum No. 1.04

TABLE II  
SYSTEM NOISE SUMMARY  
 (SEE NOTES)

	<u>CIRCUIT GROUP</u>	<u>EQUIPMENT</u>	<u>NOISE CONTRIBUTION</u>	
			<u>INITIAL LOADING</u>	<u>MAX. LOADING</u>
1.	<u>CALABASH</u> TO <u>JASMIN</u>	RF	<u>200 PW</u>	<u>300 PW</u>
		MUX	<u>75</u>	<u>100</u>
		MISC. (W.E.L.)	<u>25</u>	<u>40</u>
		TOTAL	<u>300 PW</u>	<u>440 PW</u>
2.	<u>DOCHE</u> TO <u>JASMIN</u>	RF	<u>375</u>	<u>510</u>
		MUX	<u>70</u>	<u>100</u>
		MISC.	<u>-</u>	<u>-</u>
		TOTAL	<u>455 PW</u>	<u>610 PW</u>
3.	<u>KEYSTONE</u> TO <u>JASMIN</u>	RF	<u>210</u>	<u>330</u>
		MUX	<u>75</u>	<u>100</u>
		MISC.	<u>-</u>	<u>-</u>
		TOTAL	<u>285 PW</u>	<u>430 PW</u>
4.	_____ TO _____	RF	_____	_____
		MUX	_____	_____
		MISC.	_____	_____
		TOTAL	_____	_____
5.	_____ TO _____	RF	_____	_____
		MUX	_____	_____
		MISC.	_____	_____
		TOTAL	_____	_____

NOTES:

1. Noise may be stated in any units in current use provided they are related to the O T.L.P.

2. Noise in worst direction of transmission for each circuit group.

REA Project No. 9090  
 Seller Faritcolenge  
 Addendum No. 1.05

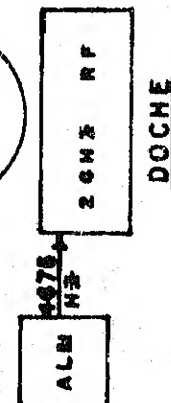
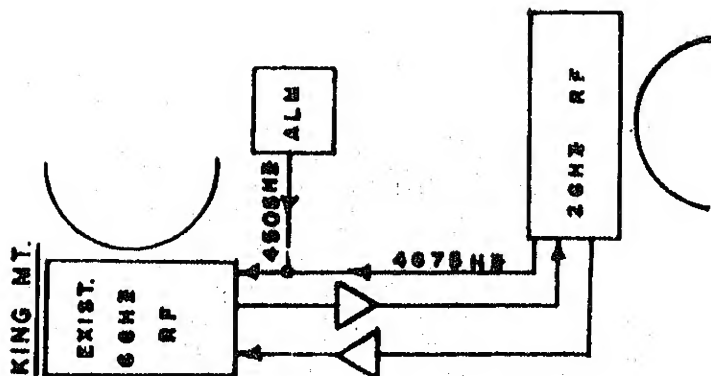
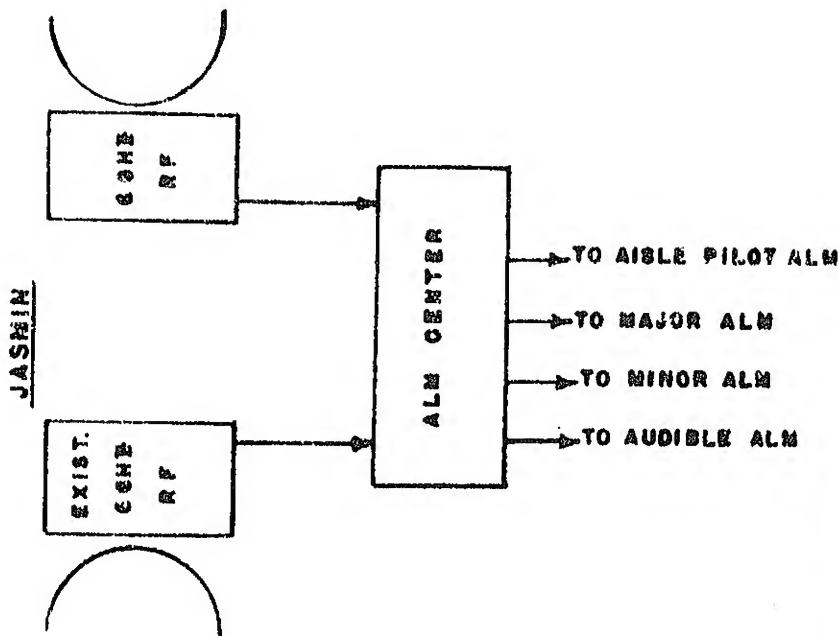
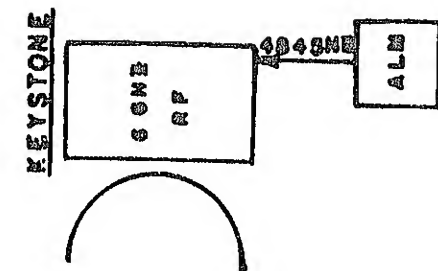
**SUMMARY OF CALCULATED POWER  
 DRAIN FOR EACH SITE**

	<u>EQUIP</u>	<u>PWR (Amps)</u>	<u>TOTAL</u>
<u>JASMIN</u>	RF	3.1	
	MUX (New)	8.3	
	MUX (Existing)	7.2	
	SF	2.4	
	ALM	<u>3.7</u>	
			24.7
<u>KEYSTONE &amp; DOCHE</u>	RF	3.1	
	MUX	8.3	
	ALM	<u>1.7</u>	
			13.1
<u>KING MOUNTAIN</u>	RF	7.2	
	ALM	<u>1.7</u>	
			8.9
<u>CALABASH</u>	MUX	2.4	2.4

**POWER PLANT RECOMMENDATIONS**

<u>Location</u>	<u>Battery</u>	<u>Charger</u>
JASMIN	Increase capacity	Add Charger
DOCHE	" "	-
KING MOUNTAIN	" "	Add Charger





REA Project No. 9090  
 Seller Peritcolonge  
 Addendum No. 1.06

FUNCTIONAL BLOCK  
 DIAGRAM OF ORDER  
 WIRE & ALM SYSTEM  
 FOR  
 SENDER TEL. CO.  
 JASMIN, OKLA.

**NOTES -**

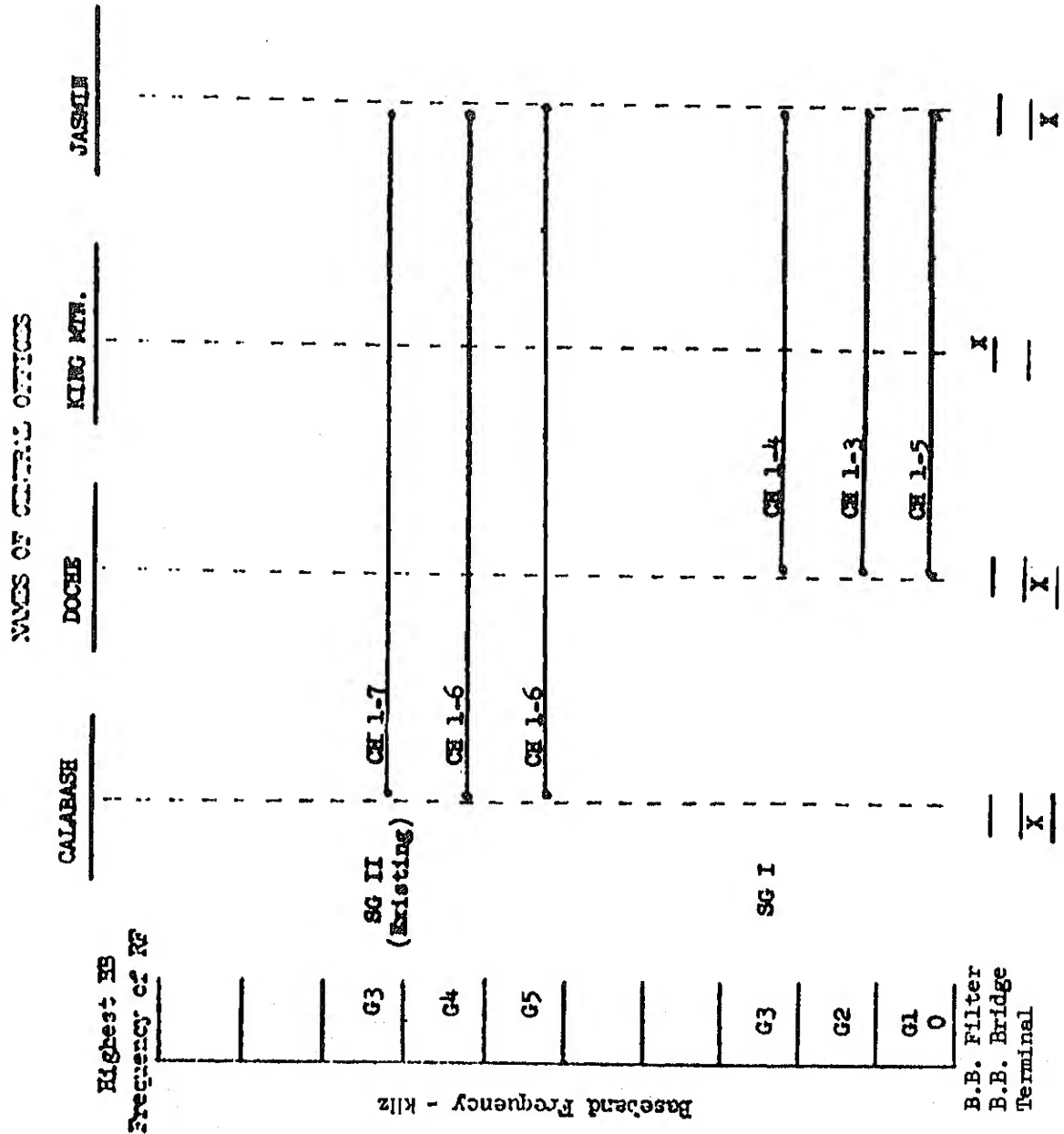
1. USE EXISTING UNUSED LEG OF VF BRIDGE IN 60MHz TERMINAL ORDER WIRE CKT.
2. LOW PASS FILTER IN EACH ORDER WIRE TERMINAL HAS MIN. 50 DB REJECTION AT 3000Hz

[illegible]

- 46 -

REA Project No. 9090  
 Seller Paritcolenge  
 Addendum No. 1.08

Baseband Spectrum Allocation Chart

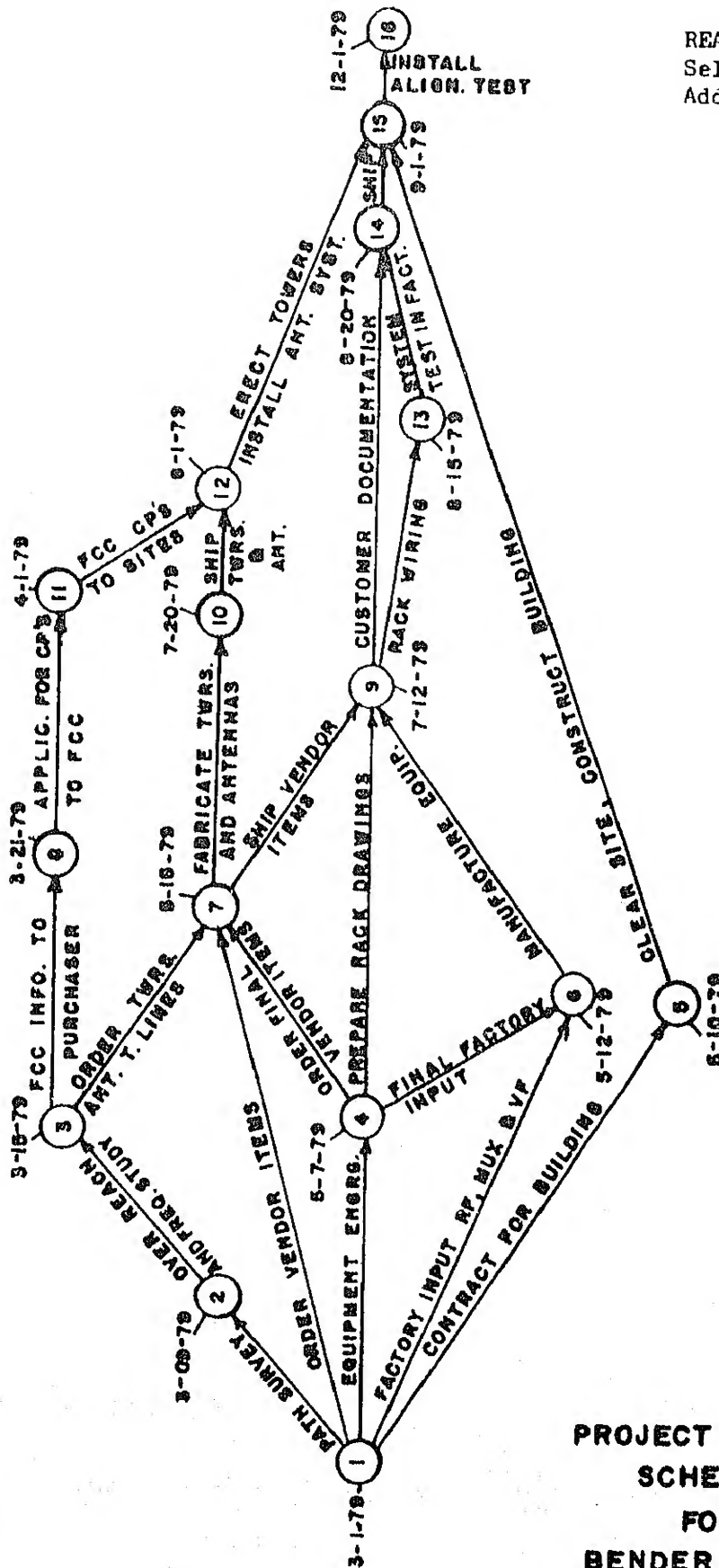


REA Project No. 9090  
 Seller Faritcolenge  
 Addendum No. 1.09

RF HOP ENGINEERING DATA

Site	Central Office or Site Ident.	JASMIN	OLD MTH.	KEYSTONE
	Latitude (N)	47-03-34	47-18-28	47-18-08
	Longitude (W)	93-55-34	93-35-58	93-26-48
Antenna System	Grnd. Elevation Rel. to MSL	1340	1876	1310
	Type of Ant. Supporting Struct.	SS	SS	SS
	Guyed, S.S., A-Frame, Other			
RF System	Type of Antenna - Dish, D-R	Shrouded Dish	Passive	Shrouded Dish
	Shrouded Dish, H-R, Passive	12	40 x 60	12
	Antenna Size			
Design	Dish - Reflector Separation Ft.	115	23	135
	of Radiating Surface Above Gnd.			
	Transmission Line	Ft.	-	215
Transmission Summary	Wave Guide Rigid 2/100	Ft.	155	0
	Wave Guide Flex	Ft.	6	6
	Included Horiz. $\angle$ of Passive Rptr.	-	129°	-
Reliability	Terminal, Active Rptr., Pass. Rptr.	Term.	Passive Rptr.	Term.
	Diversity - Freq., Space, Other			
	Non Diversity - Hot, Cold Standby	Non-Div.		Non-Div.
Design	Frequency Band	GHZ	6.175	6.175
	Frequency Separation	%	.6	.6
	Fresnel Zone Radius	Fraction	1	1
Transmission Summary	K Factor 4/3, 1, 2/3, Other		15	15
	Tree Growth Allowed	Ft.	-	40
	Fade Margin Objective	DB	23.0	7.7
Reliability	Path Length	Mi.		
	Path Loss (Free Space)	DB	139.7	130.0
	Antenna System Losses	DB	3.1	4.2
Reliability	Misc. Losses	DB	1.3	1.3
	Total		144.1	135.6
	Antenna System Gains	DB	44.5 + 57	57 + 44.5
Reliability	Transmitter Gain, Effective	DBM	33	-
	Total		134.5	101.5
	Calculated Received Power	DBM	-	-43.7
Reliability	Minimum Receive Pwr for 30DB S/N	DBM	-	-84
	in 3.1 KHZ Baseband Slot			
	Fade Margin Calculated	DB	40.3	40.3
Reliability	Time Below Free Space (Rayleigh)	%	.005	.001
	$\Sigma$ of Time Below Free Space ( $\Sigma s$ )	%	.006	-
	Diversity Improvement ( $\Sigma s^{1.5}$ )	%	Assumes 2% Separation	
Reliability	Propagation Reliability (100- $\Sigma s$ )	%	100 - .006 = 99.994	99.99+

REA Project No. 9090  
 Seller Faritcolenge  
 Addendum No. 1.11



**PROJECT COMPLETION  
 SCHEDULE  
 FOR  
 BENDER TEL. CO.  
 JASMIN, OKLA.**